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**G09F 13/22**

(52) UK CL (Edition K)

**G5C CEP**

(56) Documents cited

**GB 1365333 A**

**US 4466208 A**

**US 4327511 A**

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**US 3680237 A**

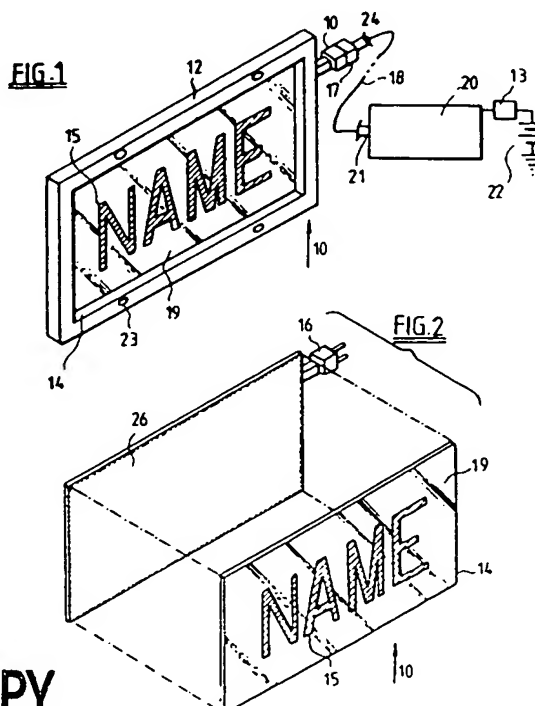
(58) Field of search

**UK CL (Edition J) G5C CEL CEP**

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(54) **Colour displays**

(57) This invention concerns colour displays and more particularly to a multi-coloured display (10) using an electroluminescent light panel (26) which is suitable for daylight and darkened conditions. An overlay (14) having designated indicia (15) and background areas (19) is positioned upon the panel (26) to allow light to selectively shine through. The indicia (15) areas may be furnished with a first colour which is visible in daylight, and also in darkness by energising the electroluminescent light panel (26); the remaining background (19) areas of the overlay may be coloured with a transparent second colour which is visible during the day or night. A spectrum of colours is also readily available for use in the indicia and background areas to provide a variegated display. The display may be mounted within a frame (12) for ready application to a vehicle.



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FIG. 1

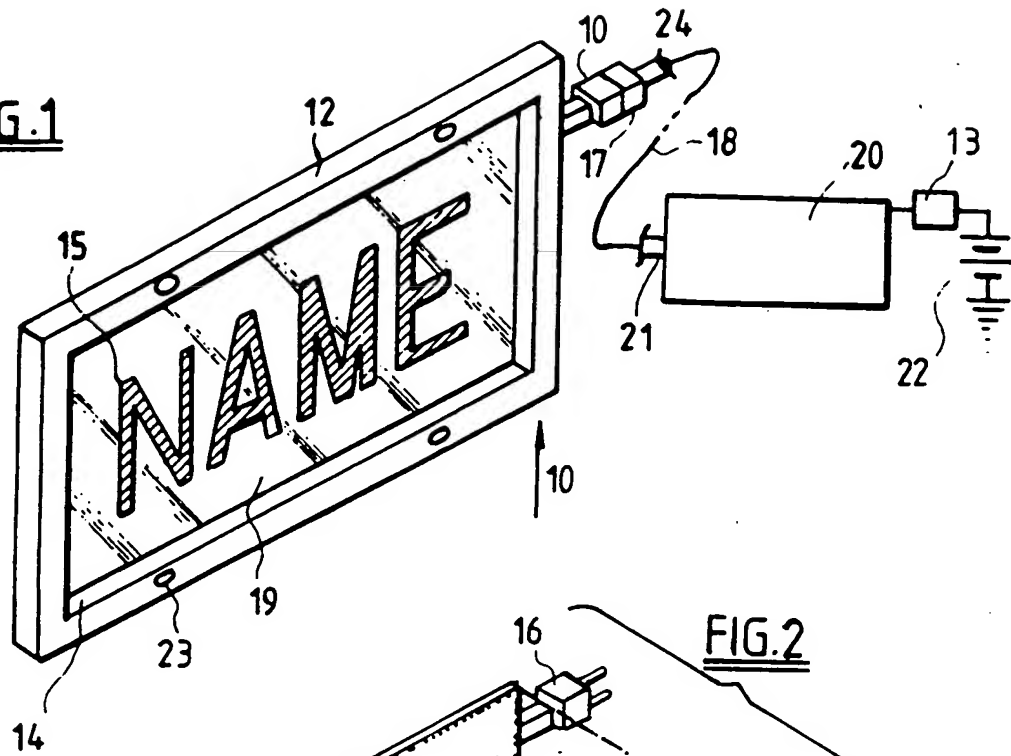


FIG. 2

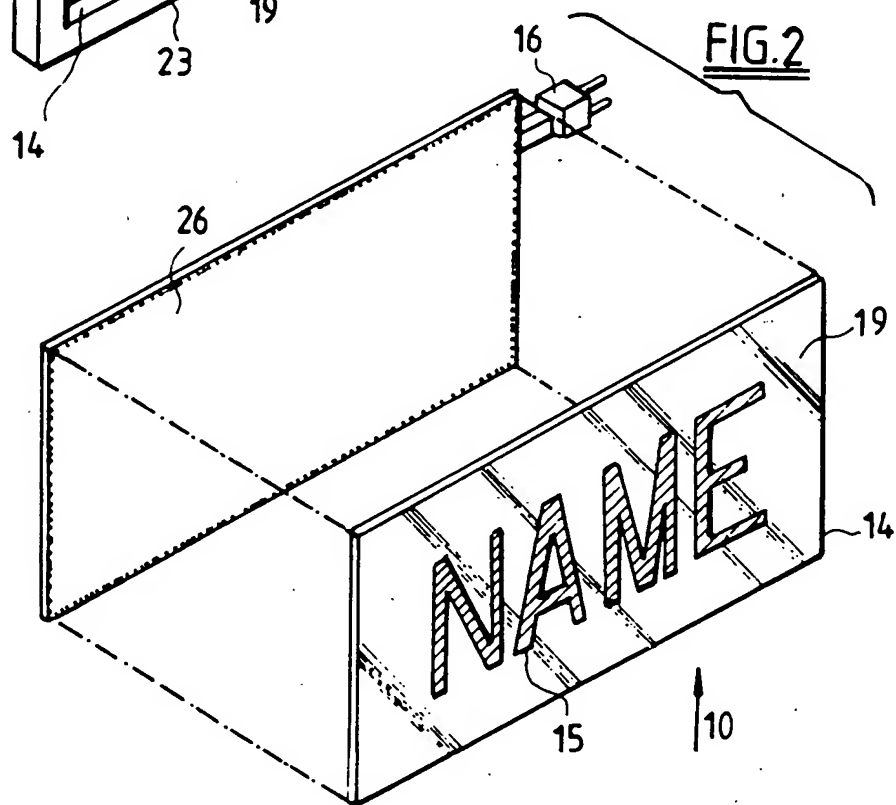
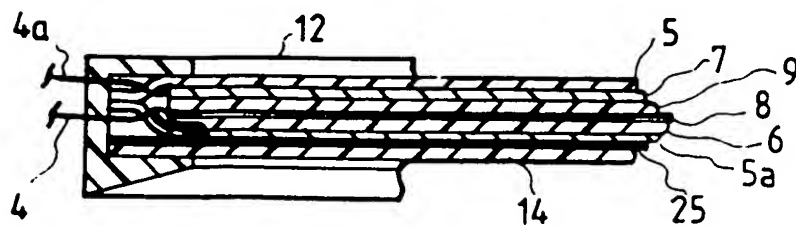


FIG. 3



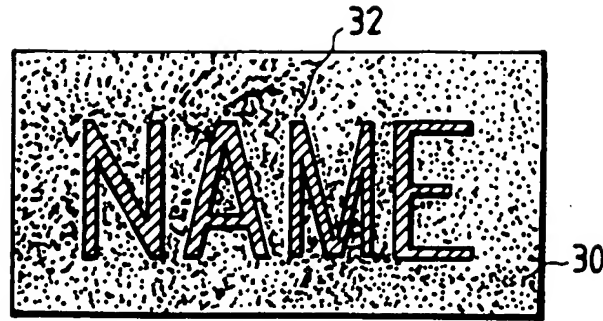


FIG. 4

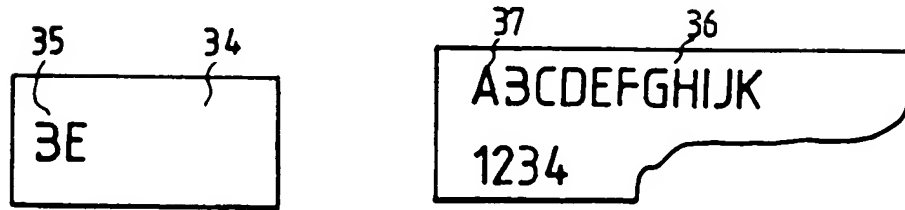


FIG 5

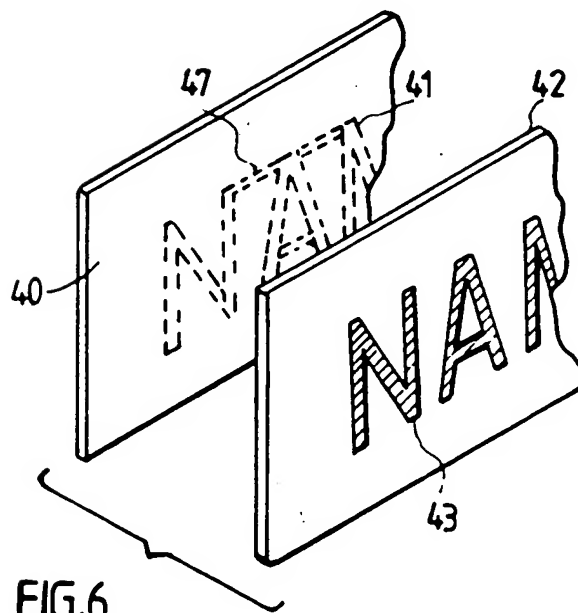


FIG. 6

FIG. 8

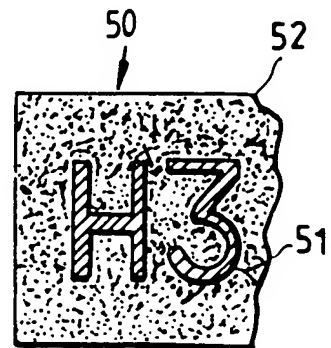
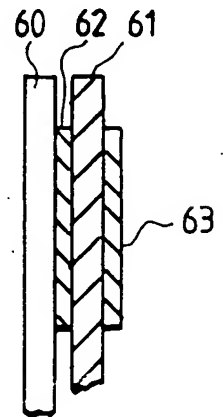


FIG. 7

DESCRIPTION

"COLOUR DISPLAYS"

This invention relates to the field of colour displays and in particular relates to such displays as informational license or vanity plates or tags for automobiles, trucks and other vehicles.

Vanity plates carrying a multi-coloured logo, name, emblem, college or university identification, for example, are usually hung on a vehicle's front bumper and hence do not usually receive direct illumination. These plates are conventionally illuminated indirectly by the light furnished by another (oncoming) vehicle's head light and this is not usually sufficient to make the plate indicia readable during night hours. However, if such a vanity plate is provided with illumination, it is furnished by means of an incandescent light which is usually located in a lamp assembly directly above the plate. When the lamp assembly is located above the plate, the light does not focus directly upon the indicia, but rather is intended merely to wash the plate with light. In the prior illumination arrangements the indicia remain difficult to see particularly when they are covered with dirt, grime and during adverse weather conditions. Accordingly, the illumination

for the vanity plate is deemed to have serious shortcomings since it is readable mostly during the daylight hours only. In addition, the present-day vanity plate does not lend itself to easy replacement when the whim of the vehicle owner desires change of the display, or other reasons call for such change. This requires that another metal, plastics or cardboard type plate be purchased and installed after the prior plate has been removed and discarded. This procedure is deemed expensive and burdensome and not conducive to simplified replacement.

In a similar manner, the present-day metal and dual coloured license plate is deemed to be deficient in many aspects and especially from a law-enforcement viewpoint. This deficiency is particularly noticeable during the period of the day extending from dusk to early dawn when a driver has his vehicle lights on; during these hours the plate is illuminated by the conventional incandescent lamp assembly usually located at the top of the plate. The light wash provided by the present-day incandescent lamp assembly creates shadows on the plate since there is an uneven distribution of light. In addition, the poor light distribution does not allow easy recognition of the colours especially when the

viewing span is of short duration. Hence, this state-of-the-art method of plate illumination is not deemed to be satisfactory because of its inability to enable the indicia in the form of letters and numerals to be easily distinguished from its background by the everyday citizen or law-enforcement officer under the severe conditions discussed.

It is well recognised that the present day problem of uneven distribution of vehicle plate illumination cannot be solved by use of a plurality of incandescent lamps positioned at discrete locations. The primary reason is that it is uneconomical to use a plurality of lamps to provide a multiple light wash from the front of the plate. On the other hand, if a back lighting scheme were to be employed with a translucent type plate, a light piping arrangement would be necessary in order to create light at each desired location. This arrangement is also deemed to be uneconomical and unwieldy. Hence, the use of the incandescent light is not feasible, useful or practical from a standpoint of modern day plate illumination.

Prior art known patents such as U.S. Patent Specifications Nos. 4,684,353 and 4,494,326 disclose electroluminescent displays of various types. U.S. Patent No. 4,684,353 teaches how an electroluminescent

panel may be constructed and how various display devices may be devised by employing different phosphors.

Informational images may be provided by the teachings of this patent by forming the back electrode of the panel into an image which is then electrically energised with another electrode. However, there is no showing by the patentee of how multi-coloured displays may be designed, or how the images may be viewed by an observer during daylight and night hours except by continuous energisation of the panel. This is not a suitable or practical solution to every day use of electroluminescent displays particularly in the transportation industry.

U.S. Patent Specification No. 4,494,326 illustrates and teaches how an electroluminescent lamp of various colours is positioned inside a light permeable pattern of a display so that during daylight hours the colour provided by the lamp is seen through the light permeable pattern. Furthermore, during the night hours a switch is turned ON and the phosphor or luminescent layer is activated to emit coloured light. The light from the lamp passes through the light pattern to make the display visible to an observer. The patentee has disclosed a somewhat complex arrangement for achieving single coloured displays, but he does not disclose how

to make them multi-coloured. In a second embodiment, the patentee uses a coloured film to allow the same colour to be viewed during the daylight as is present during the hours of darkness.

The present invention seeks to obviate the shortcomings of the prior art by illuminating the coloured indicia, or alternatively, the differently coloured background, or both the background and the indicia on the plate or display directly from its rear in order to provide clearly-delineated multi-coloured information to an observer. This is accomplished by providing uniform lighting to the plate and by this means the indicia in the form of numerals, letters, logo or names, and so forth becomes more clearly distinguishable during hours of daylight or darkness. The multi-coloured aspect of the display also make such an entity attractive and pleasing to the eye.

It is an object of this invention to provide a novel multi-coloured lighting display arrangement for a license or vanity plate, tag or similar device.

A multi-coloured display utilising an electro-luminescent element is disclosed for use in a license, vanity or emblem-carrying plate. The plate is comprised of the electroluminescent element which acts as a light source behind an overlay that carries coloured indicia to be displayed on a differently



coloured background area in a multi-coloured display. The light is selectively transmitted via the overlay through the indicia and background area to provide the contrasting colour arrangement of the display for night observance, and is designed to furnish a colour contrast during daylight hours. The display is intended to utilise application of continuous lighting so that it is spread evenly across all areas where light is selected to pass. The invention is also readily adaptable in providing a variety of colours in the indicia and background area; in addition, the display may provide one colour for day viewing and present a second colour for viewing in darkness.

According to the present invention then, a colour display comprises a flat electroluminescent element which is adapted to be energised for providing a source of light; an overlay for positioning in juxtaposition to said element and incorporating indicia positioned upon a background area; said overlay including means whereby said indicia are coloured differently with at least a first colour from said background area for daylight viewing with at least a second colour, and is coloured during darkness by causing said electroluminescent element to be energised to allow light to selectively pass through said indicia and background area whereby a

low energy multi-coloured plate is provided having uniform back lighting.

Also according to the present invention, a colour display comprises an electroluminescent element having first and second electrodes, the first electrode being formed into a continuous indicia and the element being energisable by a low energy source to generate a source of light; and an overlay which includes a translucent indicia for positioning in juxtaposition and in alignment with the electroluminescent indicia, the overlay indicia comprising at least a first colour and the remaining area of the overlay providing a background area having at least a second colour; thereby providing a low energy multi-coloured plate having uniform back lighting.

The invention will now be further described way of examples with reference to and as illustrated in the accompanying drawings, in which:-

Fig. 1 is an isometric view of one embodiment of the invention, illustrating a coloured display which is positioned within a frame member;

Fig. 2 is an exploded isometric view of the embodiment of Fig. 1;

Fig. 3 is a cross-sectional view through the display of Fig. 1, and illustrates the various layers

forming the electroluminescent light panel, overlay and frame;

Fig. 4 is another embodiment of the invention, illustrating a different type overlay;

Fig. 5 is yet another embodiment of the invention, which shows various alpha-numeric characters which may be removed from a strip to form a customised display;

Fig. 6 is another embodiment of the invention, which utilises a design formed in the electroluminescent panel for use with a similar design in the coloured transparent overlay;

Fig. 7 is another embodiment of the invention depicting a multi-coloured license tag; and

Fig. 8 is yet another embodiment of the invention which depicts an arrangement for transmitting different colours during daylight and night time hours.

Referring now to Fig. 1 there is shown in isometric form the display 10 of the invention which is designed to be multi-coloured to the eyes of an observer. The display 10 finds use in a preferred embodiment as an attachment to the bumper of a vehicle such as an automobile or truck where it takes the form of a vanity plate. When utilised in this manner the display 10 exhibits various indicia in the form of alphabetized characters which are formed into names, abbreviations, titles, universities, cities, states and various

sayings; the indicia may also be formed into logos, symbols and other similar informational displays. The display 10 is conventionally located in a frame 12 which readily attaches via holes 23, for example, for receiving a screw or bolt for joining to a bumper or other appropriate part of the vehicle.

Display 10 of Fig. 1 may be clearly seen and appreciated by referring to the exploded view of Fig. 2 which clearly depicts its various elements comprised essentially of an electroluminescent element of light panel 26 arranged behind and in juxtaposition to an overlay 14 which carries the aforementioned indicia 15. The electroluminescent panel 26 is a flat and relatively thin member which provides a cool source of light with constant colour and controllable brightness using a low level of current and power. The light panel 26 is designed to withstand shock and vibration, is flexible, has minimum space requirement, is not affected by low temperatures and performs usefully over long time periods. The energising source for activating the element 26 is supplied by a D.C. battery 22 via an inverter 20 as seen in Fig. 1. The output 21 of the inverter 20 is directed through a cable 18 to the input 24 of the respective male and female connectors 16, 17. The purpose of the inverter 20 is to

transform the D.C. voltage from supply 22 into an A.C. source which is necessary to achieve the operational characteristics of the light panel 26. An optional arrangement for activating the light panel 26 utilises a semiconductor chip 13 for intermittently applying energy to the inverter 20. The chip is well known as the 550 model and is made by various vendors such as Motorola. It is understood that the supply 22 may be the battery of an automobile, truck or other type vehicle. The electroluminescent element 26 is also a well known device which is described in U.S. Patent Specification No. 4,684,353 and may be seen in cross-section in Fig. 3; it consists essentially of a plurality of layers arranged in the following manner: a phosphor layer 9 placed upon an insulating film 8; front and rear electrodes 6, 7, respectively, in the form of silver conductive ink placed upon either side of the phosphor material. The electrodes 6, 7 are activated to allow the generated light to be transmitted downwardly as viewed in the drawings and through the overlay 14 as will be discussed further hereinbelow. The leads 4, 4a that are attached to the respective electrodes 6, 7 are ultimately connected to the male electrical connector 16 as viewed in Figs. 1 and 2. The various components of the light panel 26 are also sealed by encapsulation means 5, 5a for the purpose

of making them impervious to harmful environmental elements and to keep out moisture. Various coloured light such as white, red, blue, green and yellow may be emitted from the electroluminescent element 26 depending upon the type phosphor used in layer 9.

Referring again to Figs. 1 and 2, an overlay 14 is shown positioned in juxtaposition to the electro-luminescent light panel 26 within the fixed frame 12. In the example described hereinbelow the light produced by the light panel 26 is white in colour. The overlay 14 comprises a flexible plastic material such as sold under the trademark, LEXAN, and having a thickness in the range of 2-60 mils. The overlay 14 is highly durable and impervious to rigorous weather elements such as rain, snow or sleet including harmful chemicals. The overlay 14 of the embodiment provides a frosted or whitish surface background 19 which is transparent to light; in addition, the indicia in the form of a name 15 is applied to the overlay surface by the process of silk screening or similar printing method. Silk screening causes the name 15 to be formed with a coloured ink upon the frosted surface of the overlay 14 by its printing process. The silk screening process is applied with a transparent or light permeable ink that allows the printed name to become translucent to light emanating

from the electroluminescent element 26. If the silk screening causes the applied colour to be blue, a multi-coloured display 10 is provided consisting of the blue name 15 which is formed upon the frosted or white background 19. During the daylight hours, the blue and white display is clearly visible to an observer, whereas, during darkness the same multi-coloured display is visible by energising the element 26 via the inverter 20 and battery 22. Although the above discussion has been restricted to a dual colour combination, it is readily apparent to those skilled in the art that a spectrum of colours may be employed as, for example, by printing a different translucent colour for each letter of the name. Similarly, the background area 19 of the overlay 14 may be printed with a variety of different colours to produce a variegated display. It is also within the scope of the invention to arrange the overlay 14 to utilise, for example, colours such as yellow indicia 15 upon a white background 19 which would represent the true colours as witnessed during daylight; however, with a light panel 26 which emitted a blue light the yellow would appear as a green colour. Hence, the many options that are available in constructing the display of this invention enhance its versatility.

The embodiment shown in Figs. 1 and 2 is designed in a manner that allows the overlay 14 to be slidably

engaged within the frame 12 as may be appreciated by referring to Fig. 3. The overlay 14 is positioned within the frame 12 and maintained against the light panel 26 by means of an adhesive material 25. The adhesive 25 is sufficiently strong to hold the overlay 14 firmly in place, but on the other hand when there is a desire to change the overlay 14 for various reasons it is merely slid out by applying a slight pressure. It may be then replaced by another overlay having a different name or logo.

Fig. 4 illustrates another embodiment of the invention wherein the overlay 30, for example, includes the indicia 32 in the form of a transparent name that is clear or white in colour and the remaining background area is provided with a contrasting translucent colour. The overlay 30 is sized in like manner to the overlay 14 and therefore is adapted for facile sliding into the slot provided by frame 12 as previously described with respect to Fig. 3. The various colours required for the overlay 30 may also be obtained by the silk screening process which forms the desired coloured indicia and background area pattern upon the rectangular plastic substrate. Pigment applied by silk screening is designed to be such that the colours are visible during the daylight hours and when the light panel 26 is



appropriately energised the similar combination of colours will appear during time of darkness.

Another embodiment of the invention is illustrated in Fig. 5 where an arrangement for making a customised overlay 34 is disclosed. The overlay 34 depicts a rectangular member of flexible plastic which incorporates, by way of example, a frosted or white-like transparent surface colouring. A rectangular strip 36 shown in a broken away view provides indicia in the form of a plurality of alpha-numeric characters 37 which are attached by an adhesive permitting easy separation of the character from the strip. In order to design a custom display for sliding into the frame 12 of Fig. 1 the letters such as, for example, the B letter as well as the letter E are peeled off of the strip 36 and located in juxtaposition to one another to form the beginning of an indicia 35 as a word or combination of words. The alpha-numeric characters 37 are manufactured with a certain hue in addition to being made translucent; and, when placed upon the translucent overlay 34, the colour combination selected will be clearly visible to an observer by means of the activation of the electroluminescent panel 26 during the hours of darkness. During the daylight the colour of the characters 37 with respect to the background will also be visible.

Another embodiment of the invention is depicted in Fig. 6 wherein the electroluminescent panel 40 is formed so that its back electrode 7 (see Fig. 3) which is made out of a silver conductive ink represents the indicia 41 to be carried by the display 10 of Fig. 1. However, since the indicia 41 is also an integral part, that is, an electrode, of the light panel 40 it must be formed continuously so that each separate character is joined to one another as by the junction ~~member 47~~. In this manner electrical current is allowed to pass through the electrodes via leads (not shown) which are similar to leads 4, 4a in Fig. 3. When the panel 40 is energised via an inverter 20 and battery 22 the indicia 41 is lit and transmits a colour such as white, yellow, green, red and blue as determined by the phosphors used. Therefore, in order to produce a colour that is not available in basic phosphors of the light panel 40 the overlay 42 is provided with a dark blue colour, for example, by the silk screening method, and the indicia 43 is designed to exactly duplicate the indicia 41; in this manner, the activation of the light panel 40 which has a white or blue phosphor will cause light to emanate through the translucent dark blue indicia 43. The remaining area of the overlay 42 may be coloured in a suitable

contrasting colour with respect to the indicia for overall viewing. This type of multi-coloured vanity plate display is particularly suitable where the indicia 43 does not change.

Fig. 7 depicts a broken view of another embodiment of the invention comprising an overlay 50 in the form of a license tag for vehicular use. The rectangular shape overlay 50 is designed for use in the frame 12 of Fig. 1 and essentially comprises a plastic substrate upon which is formed the dual colours comprising the indicia 51 and background 52 as required to identify a particular state. In a manner previously described the printing of the background 52 and indicia 51 colours may be printed by silk screening or similar technique with a pigment which is transparent to light emitted by the light panel 26. Therefore, as previously discussed, during the daylight the dual coloured license tag display will be visible as well as during the hours of darkness when the light panel is energised.

Fig. 8 illustrates another embodiment of the invention which is represented by a sectional view through a typical indicia of an overlay 61. Upon the overlay 61 is printed as by silk screening an indicia 63 in, for example, the form of a numeral. The pigment applied is white and transparent and appears as such during the day. Upon the backside of the overlay 61 is

printed another pigment 62 having, for example, the colour red. When the display is energised by the electroluminescent light panel 60 for night viewing the colour seen by an observer will be pink. therefore, the light transmitted by panel 60 will be transmitted through two layers of pigment for night viewing and only the white pigment will be observed for daytime observance when the lamp is not energised. It should be understood that the overlay 61 and light panel 60 is for use in the framing structure 12 of Fig. 1.

The various embodiments of the invention in Figs. 1 to 8 have been above described by stating that the silk screen printing of the indicia and background areas of the overlay are translucent. However, it is understood that it is within the purview of the art that under certain circumstances and needs either the indicia or the background may be opaque, and the remainder of the overlay be it the background or indicia is translucent. If, for example, it is desired that the background area is made opaque and the indicia transparent, it is understood that only the indicia will stand out during darkness, and the contrasting colours of the indicia and background will be evident during the daylight. It is further within the purview of the art that although the various embodiments were described with respect to the

use of a white light panel, it is nevertheless understood that a different coloured electroluminescent light might be utilised in order to achieve special lighting or background effect. It is also understood that the invention is easily adaptable in all of its embodiments to provide a spectra of colours by silk screening each letter of the indicia with a different colour as well as various areas with the overlay.

In summary, the present invention has been developed in order to achieve improved lighting of the indicia and its background over presently existing vanity and license plates or tags. As discussed herein, the reason for the improved lighting that is obtained results from directing continuous uniform light from the rear of the plate rather than using incandescent lighting from above or from the sides. This causes the indicia to become clearly delineated and sharply focused in contrast to the prior art technique. The use of the electroluminescent light panel is also significant because it draws little current and consumes minimum power.

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CLAIMS

1. A colour display comprising a flat electroluminescent element which is adapted to be energised for providing a source of light; an overlay for positioning in juxtaposition to said element and incorporating indicia positioned upon a background area; said overlay including means whereby said indicia are coloured differently with at least a first colour from said background area for daylight viewing with at least a second colour, and is coloured during darkness by causing said electroluminescent element to be energised to allow light to selectively pass through said indicia and background area whereby a low energy multi-coloured plate is provided having uniform back lighting.

2. A colour display as claimed in claim 1 wherein the indicia comprises alpha-numeric characters.

3. A colour display as claimed in claim 1 wherein the indicia comprise combined alpha characters to form a name, or alternatively, abbreviations and words.

4. A colour display as claimed in claim 1 wherein the indicia comprises a logo.

5. A colour display as claimed in claim 1, 2, 3 or 4 and further comprising a frame to hold said electroluminescent element and overlay in a juxtaposed relationship.

6. A colour display as claimed in claim 5 wherein the electroluminescent element is fixed in place within the frame, and the overlay has first indicia which may be removed for replacement with another overlay having second indicia.

7. A colour display as claimed in any one of claims 1 to 6 wherein the overlay is held in position against the electroluminescent element via a fastening means.

8. A colour display as claimed in claim 5 or 6 wherein the frame is adapted for attachment to a vehicle.

9. A colour display as claimed in any one of claims 1 to 8 wherein the electroluminescent element is adapted to be energised by a low voltage D.C. supply which is applied through an inverter.

10. A colour display as claimed in claim 9 wherein the electroluminescent element is adapted to be energised through means which causes the light source to blink.

11. A colour display as claimed in any one of claims 1 to 10 wherein the indicia and background area are translucent to allow light from the element to pass through both during periods of darkness.

12. A colour display as claimed in any one of claims 1 to 10 wherein the indicia is translucent and

the background area is opaque to allow light from the element to partially pass through the plate.

13. A colour display as claimed in any one of claims 1 to 10 wherein the indicia is opaque and the background area is translucent to allow light from the element to partially pass through the plate.

14. A colour display as claimed in claim 1 wherein the overlay comprises indicia removed from a strip containing at least one such indicia, said indicia being coloured differently with at least a first colour from the remainder of the overlay which is coloured with at least a second colour for daylight viewing, and is similarly coloured during darkness by causing the element to be energised for allowing light to selectively pass through the indicia and background area.

15. A colour display as claimed in claim 14 wherein the indicia and background area are both translucent.

16. A colour display as claimed in claim 14 wherein the background area is opaque and the indicia is translucent.

17. A colour display as claimed in claim 14 wherein the background area is translucent and the indicia is opaque.



18. A colour display as claimed in any one of claims 1 to 17 wherein the overlay may be slidably removed and replaced by another slidable overlay incorporating differently designed indicia.

19. A colour display as claimed in claim 18 wherein the slidable overlay comprises a transparent indicia having at least a first colour and an opaque background area having at least a second colour.

20. A colour display as claimed in claim 18 wherein the slidable overlay comprises an opaquely coloured indicia having a first colour and a transparent background area having a second colour.

21. A colour display comprising an electroluminescent element having first and second electrodes, the first electrode being formed into a continuous indicia and the element being energisable by a low energy source to generate a source of light; and an overlay which includes a translucent indicia for positioning in juxtaposition and in alignment with the electroluminescent indicia, the overlay indicia comprising at least a first colour and the remaining area of the overlay providing a background area having at least a second colour; thereby providing a low energy multi-coloured plate having uniform back lighting.

22. A colour display as claimed in claim 21 for vehicular use and further comprising a frame adapted for

attachment to a vehicle; the electroluminescent element being adapted for positioning in the frame, the overlay being slidably positioning in juxtaposition to the element within the frame, and wherein the overlay indicia is coloured differently with at least a second colour for daylight viewing, and is similarly coloured during darkness by energising the element for allowing light to selectively pass through the indicia and background.

23. A colour display as claimed in claim 21 or 22 wherein, the electroluminescent element is flat, the overlay has a front and rear section for positioning in juxtaposition to the element, the overlay indicia is positioned upon the background area along the front section; the overlay indicia is coloured with a first pigment and is coloured with a second pigment on the rear section; the background area is further coloured with at least a third pigment; the colour of the indicia being determined by the second pigment in contrast with the third pigment of the background area when the electroluminescent element is energised, and the colour of the indicia being determined by the first pigment in contrast with the third pigment when the element is not energised.

24. Colour displays substantially as herein  
described with reference to and as illustrated in the  
various embodiments shown in the accompanying drawings.  
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